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March 13, 2002

BOX PCT

Commissioner for Patents
Washington, D.C. 20231

PCT/IE00/00105
-filed September 13, 2000

Re: Application of **Michael Joseph MCLAUGHLIN**

A METHOD FOR TRANSMITTING DATA BETWEEN RESPECTIVE FIRST AND SECOND MODEMS IN A TELECOMMUNICATIONS SYSTEM, AND A TELECOMMUNICATIONS SYSTEM

Assignee: **FERNWAY LIMITED**

Our Ref: **Q68972**

Dear Sir:

The following documents and fees are submitted herewith in connection with the above application for the purpose of entering the National stage under 35 U.S.C. § 371 and in accordance with Chapter II of the Patent Cooperation Treaty:

- ☑ an executed Declaration and Power of Attorney.
- ☑ an English translation of the International Application.
- ☑ 2 sheets of drawings.
- ☑ an executed Assignment and PTO 1595 form.
- ☑ a Form PTO-1449 listing the ISR references.
- ☑ a Preliminary Amendment

It is assumed that copies of the International Application as filed, the International Search Report and complete copies of all the references cited therein, the International Preliminary Examination Report, copy of certified priority document, and any Articles 19 and 34 amendments as required by § 371(c) will be supplied directly by the International Bureau, but if further copies are needed, the undersigned can easily provide them upon request.

Applicant claims benefit of small entity status in accordance with 37 CFR § 1.27.

Please see attached preliminary amendment before calculating Government filing fee.

The Government filing fee is calculated as follows **(Small Entity fees apply)**:

Total claims	20	-	20	=	0	x	$9.00	= $.00
Independent claims	2	-	3	=	0	x	$42.00	= $.00
Base Fee								$445.00

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TOTAL FILING FEE	$445.00
Recordation of Assignment	$ 40.00
TOTAL FEE	$485.00

Checks for the statutory filing fee of $445.00 and Assignment recordation fee of $40.00 are attached. You are also directed and authorized to charge or credit any difference or overpayment to Deposit Account No. 19-4880. The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16, 1.17 and 1.492 which may be required during the entire pendency of the application to Deposit Account No. 19-4880. A duplicate copy of this transmittal letter is attached.

Priority is claimed from:

Country	Application No	Filing Date
IRELAND	S990767	September 13, 1999

Respectfully submitted,

Robert V. Sloan
Registration No. 22,775

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Date: March 13, 2002

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Michael Joseph MCLAUGHLIN	PCT/IE00/00105
Appln. No.: not yet assigned	Attorney Docket Q68972
Confirmation No.: Not yet assigned	Group Art Unit: Not yet assigned
Filed: March 13, 2002	Examiner: Not yet assigned

For: A METHOD FOR TRANSMITTING DATA BETWEEN RESPECTIVE FIRST AND SECOND MODEMS IN A TELECOMMUNICATIONS SYSTEM, AND A TELECOMMUNICATIONS SYSTEM

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination, please amend the above-identified application as follows:

IN THE SPECIFICATION:

Please amend the specification as follows:

Page 1, after the title insert the following statements and heading

--This is a National stage entry under 35 U.S.C. § 371 of Application No. PCT/IE00/00105 filed September 13, 2000; the disclosure of which is incorporated herein by reference.--

BACKGROUND OF THE INVENTION

Page 2, after the first full paragraph insert the heading

SUMMARY OF THE INVENTION

Page 9, before the first paragraph insert the heading

BRIEF DESCRIPTION OF THE DRAWINGS

after the description of figure 3 insert the heading

DETAILED DESCRIPTION OF THE INVENTION

IN THE CLAIMS:

Please cancel claims 1-56 without prejudice or disclaimer.

Please add the following new claims:

57. A method for transmitting data between respective first and second modems (5,6) in a telecommunications system (1) wherein at least one of the modems (5,6) is a PCM modem (5), characterized in that the method comprises the steps of selecting respective high and low data transmission rates for the respective modems (5,6) during handshaking, the respective high and low data transmission rates for the respective modems (5,6) being the same or different, and setting the modems (5,6) to transmit at their respective high data transmission rates during transmission in response to the volume of data to be transmitted such that neither of the two modems (5,6) are set to transmit at their respective high data transmission rates until the other of the two modems (5,6) has been set to transmit at its low data transmission rate.

58. A method as claimed in Claim 57 characterized in that the high data transmission rates of the respective modems are different, and the low data transmission rates of the respective modems are different, and preferably, the high and low data transmission rates of the first modem (5) are selected by selecting corresponding high and low transmission power levels.

59. A method as claimed in Claim 57 characterized in that the high and low data transmission rates of the first modem (5) are selected by selecting the spacing between signal levels of the data signal to be transmitted, and preferably, the high and low data transmission

rates of the second modem (6) are selected by selecting the spacing between signal levels of the data signal to be transmitted, and advantageously, the data signals are transmitted as constellation points.

60. A method as claimed in Claim 59 characterized in that the low data transmission rate of the first modem (5) is selected by increasing the spacing between the constellation points, and preferably, the low data transmission rate of the second modem (6) is selected by increasing the spacing between the constellation points.

61. A method as claimed in Claim 57 characterized in that the respective modems (5,6) are responsive to a switch signal received from the other of the two modems (5,6) for switching from one data transmission rate to the other, and preferably, the second modem (6) is responsive to the received switch signal received from the first modem (5) for switching from its high data transmission rate to its low data transmission rate, and advantageously, each modem (5,6) is responsive to the received switch signal for switching from its high data transmission rate to its low data transmission rate, and preferably, each modem (5,6) is responsive to the received switch signal only if the volume of data to be transmitted by that modem (5,6) no longer requires the high data transmission rate, and advantageously, the switch signal is provided by a predetermined signal, and preferably, the switch signal comprises at least one illegal constellation point, and advantageously, the at least one illegal constellation point is followed by a predetermined sequence of legal constellation points, and ideally, the switch signal comprises a predetermined sequence of legal constellation points, and preferably, the predetermined sequence of legal constellation points is an illegal sequence, and preferably, the switch signal comprises a

predetermined frame of data signals, and advantageously, the switch signal comprises a reversed bit or byte.

62. A method as claimed in Claim 57 characterized in that the respective high and low data transmission rates of at least one of the modems (5,6) are determined in response to the amount of echo, and preferably, the high and low data transmission rates of the at least one modem (5,6) are determined for minimizing echo, and preferably, the respective high and low data transmission rates are determined for the first modem (5) in response to echo, and advantageously, the respective high and low data transmission rates are determined for the second modem (6) in response to echo.

63. A method as claimed in Claim 57 characterized in that the data signals transmitted between the respective first and second modems (5,6) are digitally encoded data signals.

64. A method as claimed in Claim 57 characterized in that the first modem (5) is a PCM codec modem, and the second modem (6) is a linear codec modem.

65. A method as claimed in Claim 57 characterized in that the respective high and low data transmission rates of the respective modems are alterable during a retraining interrupt during data transmission.

66. A telecommunications data transmission system comprising respective first and second modems (5,6) wherein at least one of the modems (5,6) is a PCM modem (5), the respective first and second modems (5,6) comprising handshaking means, characterized in that the respective handshaking means of each modem (5,6) comprise a selecting means (14,15) for selecting respective high and low data transmission rates for the respective modems (5,6) during

handshaking, the respective high and low data transmission rates for the respective modems (5,6) being the same or different, and each modem (5,6) comprises a means (14,15) for setting its data transmission rate at its high data transmission rate in response to the volume of data to be transmitted such that neither of the two modems (5,6) are set to transmit at their respective high data transmission rates until the other of the two modems (5,6) has been set to transmit at its low data transmission rate.

67. A transmission system as claimed in Claim 66 characterized in that the high data transmission rates of the respective modems (5,6) are different, and the low data transmission rates of the respective modems (5,6) are different, and preferably, the selecting means (14) of the first modem (5) selects the high and low data transmission rates of the first modem (5) by selecting corresponding high and low transmission power levels.

68. A transmission system as claimed in Claim 66 characterized in that the selecting means (14) of the first modem (5) selects the high and low data transmission rates of the first modem (5) by selecting the spacing between signal levels of the data signal to be transmitted, and preferably, the selecting means (15) of the second modem (6) selects the high and low data transmission rates of the second modem (6) by selecting the spacing between signal levels of the data signal to be transmitted, and preferably, the data signals are transmitted as constellation points.

69. A transmission system as claimed in Claim 68 characterized in that the selecting means (14) of the first modem (5) selects the low data transmission rate of the first modem (5) by increasing the spacing between the constellation points, and preferably, the selecting means (15)

of the second modem (6) selects the low data transmission rate of the second modem (6) by increasing the spacing between the constellation points.

70. A transmission system as claimed in Claim 66 characterized in that each modem (5,6) comprises a switch signal generating means (14,15) for generating a switch signal in response to the volume of data to be transmitted by that modem (5,6), and the means (14,15) for setting the data transmission rate of each modem (5,6) being responsive to a switch signal received from the other of the two modems (5,6) for switching the modem having received the switch signal from one data transmission rate to the other, and preferably, the means (14,15) for setting the data transmission rate of the second modem (6) is responsive to the received switch signal received from the first modem (5) for switching from its high data transmission rate to its low data transmission rate, and advantageously, the means (14,15) for setting the data transmission rate of each modem (5,6) is responsive to the received switch signal for switching from its high data transmission rate to its low data transmission rate, and preferably, the means (14,15) for setting the data transmission rate of each modem (5,6) is responsive to the received switch signal only if the volume of data to be transmitted by that modem (5,6) no longer requires the high data transmission rate, and advantageously, the switch signal is provided by a predetermined signal.

71. A transmission system as claimed in Claim 70 characterized in that the switch signal comprises at least one illegal constellation point, and preferably, the at least one illegal constellation point is followed by a predetermined sequence of legal constellation points, and

advantageously, the switch signal comprises a predetermined sequence of legal constellation points.

72. A transmission system as claimed in Claim 71 characterized in that the predetermined sequence of legal constellation points is an illegal sequence, and preferably, the switch signal comprises a predetermined frame of data signals, and preferably, the switch signal comprises a reversed bit or byte.

73. A transmission system as claimed in Claim 70 characterized in that the selecting means (14,15) for selecting the respective high and low data transmission rates of at least one of the modems (5,6) selects the respective data transmission rates in response to the amount of echo, and preferably, the selecting means (14,15) for selecting the high and low data transmission rates of the at least one of the modems (5,6) selects the respective data transmission rates for minimizsing echo, and advantageously, the selecting means (14) of the first modem (5) selects the respective high and low data transmission rates for the first modem (5) in response to echo, and preferably, the selecting means (15) of the second modem (6) selects the respective high and low data transmission rates for the second modem (6) in response to echo.

74. A transmission system as claimed in Claim 66 characterized in that the data signals transmitted between the respective first and second modems (5,6) are digitally encoded data signals.

75. A transmission system as claimed in Claim 66 characterised in that the first modem (5) is a PCM codec modem, and the second modem (6) is a linear codec modem.

76. A transmission system as claimed in Claim 66 characterized in that the selecting means (14,15) of the respective first and second modems (5,6) are operational for altering the respective selected high and low data transmission rates of the respective modems (5,6) during a retraining interrupt during data transmission.

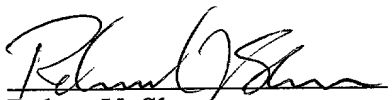
IN THE ABSTRACT:

Please delete the title shown after the heading and the improper second paragraph of the Abstract containing the parenthetical phrase "(Figs. 1 and 2 to accompany the abstract)".

REMARKS

The application has been amended to eliminate the numerous and multiply dependent present claims, to provide appropriate headings for the various sections of the specification, and to delete the erroneous improper second paragraph of the abstract. Entry and consideration of this Amendment and an early and favorable action on the merits is respectfully requested.

Respectfully submitted,



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Date: March 13, 2002

APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

The specification is changed as follows:

Page 1, after the title insert the following statements and heading

--This is a National stage entry under 35 U.S.C. § 371 of Application No. PCT/IE00/00105 filed September 13, 2000; the disclosure of which is incorporated herein by reference.--

BACKGROUND OF THE INVENTION

Page 2, after the first full paragraph insert the heading

SUMMARY OF THE INVENTION

Page 9, before the first paragraph insert the heading

BRIEF DESCRIPTION OF THE DRAWINGS

after the description of figure 3 insert the heading

DETAILED DESCRIPTION OF THE INVENTION

IN THE CLAIMS:

Claims 1-56 inclusive are canceled.

Claims 57-76 inclusive are added as new claims.

IN THE ABSTRACT OF DISCLOSURE:

Delete the title shown after the heading and the improper second paragraph of the Abstract containing the parenthetical phrase "(Figs. 1 and 2 to accompany the abstract)".

"A method for transmitting data between respective first and second modems in a telecommunications system, and a telecommunications system"

The present invention relates to a method for transmitting data between respective first and second modems in a telecommunications system, and the invention also relates to an improved telecommunications system.

In telecommunications systems echo can present problems. Echo typically arises where data is being transmitted at relatively high data transmission rates at relatively high power levels. It is known to provide echo cancellers for cancelling out echo, however in data transmission systems where digitised data is being transmitted, echo can cause significant problems as a result of distortion and corruption of data signals. This is a particular problem where data is being transmitted and received through a PCM modem due to the fact that received data signals are sampled at a relatively low resolution codec before an echo canceller has had the opportunity of removing echo from data signals. Telecommunications systems and methods for optimising between data transmission rates and echo are known. For example, in U.S. Patent Specification No. 5,289,459 of Brownlie a telecommunications system is described whereby during handshaking two data transmission rates are selected, one for transmitting in one direction and the other for transmitting in the other direction for minimising echo. However, in the transmission of digitised data between PCM modems, or between a PCM modem and a linear codec modem, the volume of data to be transmitted in the respective directions may vary from time to time. In other words, for part of the period of data transmission a high volume of data may have to be transmitted in one direction while the volume of data in the opposite direction may be relatively low, and during a subsequent part of the data transmission, the positions may be reversed whereby it may be necessary to transmit a large volume of data in the direction in which originally only a low volume data transmission was required, and vice versa. However, none of the known systems adequately provide for such a situation.

There is therefore a need for a method and a telecommunications system which accommodates varying volumes of data to be transmitted in respective opposite

directions in a telecommunications system, while at the same time minimising the effects of echo.

The present invention is directed towards providing such a telecommunications system and a method.

According to the invention there is provided a method for transmitting data between respective first and second modems in a telecommunications system wherein at least one of the modems is a PCM modem, wherein the method comprises the steps of selecting respective high and low data transmission rates for the respective modems during handshaking, the respective high and low data transmission rates for the respective modems being the same or different, and setting the modems to transmit at their respective high data transmission rates during transmission in response to the volume of data to be transmitted such that neither of the two modems are set to transmit at their respective high data transmission rates until the other of the two modems has been set to transmit at its low data transmission rate.

In one embodiment of the invention the high data transmission rates of the respective modems are different.

In another embodiment of the invention the low data transmission rates of the respective modems are different.

In a further embodiment of the invention the high and low data transmission rates of the first modem are selected by selecting corresponding high and low transmission power levels.

In a still further embodiment of the invention the high and low data transmission rates of the first modem are selected by selecting the spacing between signal levels of the data signal to be transmitted.

In another embodiment of the invention the high and low data transmission rates of the second modem are selected by selecting the spacing between signal levels of

the data signal to be transmitted.

In one embodiment of the invention the data signals are transmitted as constellation points.

In another embodiment of the invention the low data transmission rate of the first modem is selected by increasing the spacing between the constellation points.

In another embodiment of the invention the low data transmission rate of the second modem is selected by increasing the spacing between the constellation points.

In a further embodiment of the invention the respective modems are responsive to a switch signal received from the other of the two modems for switching from one data transmission rate to the other.

In another embodiment of the invention the second modem is responsive to the received switch signal received from the first modem for switching from its high data transmission rate to its low data transmission rate.

In a further embodiment of the invention each modem is responsive to the received switch signal for switching from its high data transmission rate to its low data transmission rate.

In a still further embodiment of the invention each modem is responsive to the received switch signal only if the volume of data to be transmitted by that modem no longer requires the high data transmission rate.

In one embodiment of the invention the switch signal is provided by a predetermined signal.

In another embodiment of the invention the switch signal comprises at least one illegal constellation point.

In a further embodiment of the invention the at least one illegal constellation point is followed by a predetermined sequence of legal constellation points.

In a further embodiment of the invention the switch signal comprises a predetermined sequence of legal constellation points.

In a still further embodiment of the invention the predetermined sequence of legal constellation points is an illegal sequence.

In another embodiment of the invention the switch signal comprises a predetermined frame of data signals.

In a further embodiment of the invention the switch signal comprises a reversed bit or byte.

Preferably, the respective high and low data transmission rates of at least one of the modems are determined in response to the amount of echo.

Advantageously, the high and low data transmission rates of the at least one modem are determined for minimising echo.

Ideally, the respective high and low data transmission rates are determined for the first modem in response to echo.

Advantageously, the respective high and low data transmission rates are determined for the second modem in response to echo.

In one embodiment of the invention the data signals transmitted between the respective first and second modems are digitally encoded data signals.

In another embodiment of the invention the first modem is a PCM codec modem.

In another embodiment of the invention the second modem is a linear codec modem.

In a still further embodiment of the invention the respective high and low data transmission rates of the respective modems are alterable during a retraining interrupt during data transmission.

Additionally, the invention provides a telecommunications data transmission system comprising respective first and second modems wherein at least one of the modems is a PCM modem, the respective first and second modems comprising handshaking means, wherein the respective handshaking means of each modem comprise a selecting means for selecting respective high and low data transmission rates for the respective modems during handshaking, the respective high and low data transmission rates for the respective modems being the same or different, and each modem comprises a means for setting its data transmission rate at its high data transmission rate in response to the volume of data to be transmitted such that neither of the two modems are set to transmit at their respective high data transmission rates until the other of the two modems has been set to transmit at its low data transmission rate.

In one embodiment of the invention the high data transmission rates of the respective modems are different.

In another embodiment of the invention the low data transmission rates of the respective modems are different.

In a further embodiment of the invention the selecting means of the first modem selects the high and low data transmission rates of the first modem by selecting corresponding high and low transmission power levels.

In another embodiment of the invention the selecting means of the first modem selects the high and low data transmission rates of the first modem by selecting the spacing between signal levels of the data signal to be transmitted.

In a further embodiment of the invention the selecting means of the second modem

selects the high and low data transmission rates of the second modem by selecting the spacing between signal levels of the data signal to be transmitted.

In one embodiment of the invention the data signals are transmitted as constellation points.

In another embodiment of the invention the selecting means of the first modem selects the low data transmission rate of the first modem by increasing the spacing between the constellation points.

In a further embodiment of the invention the selecting means of the second modem selects the low data transmission rate of the second modem by increasing the spacing between the constellation points.

In one embodiment of the invention each modem comprises a switch signal generating means for generating a switch signal in response to the volume of data to be transmitted by that modem, and the means for setting the data transmission rate of each modem being responsive to a switch signal received from the other of the two modems for switching the modem having received the switch signal from one data transmission rate to the other.

In another embodiment of the invention the means for setting the data transmission rate of the second modem is responsive to the received switch signal received from the first modem for switching from its high data transmission rate to its low data transmission rate.

In a further embodiment of the invention the means for setting the data transmission rate of each modem is responsive to the received switch signal for switching from its high data transmission rate to its low data transmission rate.

In a still further embodiment of the invention the means for setting the data transmission rate of each modem is responsive to the received switch signal only if the volume of data to be transmitted by that modem no longer requires the high data

transmission rate.

In one embodiment of the invention the switch signal is provided by a predetermined signal.

In another embodiment of the invention the switch signal comprises at least one illegal constellation point.

In a further embodiment of the invention the at least one illegal constellation point is followed by a predetermined sequence of legal constellation points.

In a still further embodiment of the invention the switch signal comprises a predetermined sequence of legal constellation points.

In one embodiment of the invention the predetermined sequence of legal constellation points is an illegal sequence.

In another embodiment of the invention the switch signal comprises a predetermined frame of data signals.

In a still further embodiment of the invention the switch signal comprises a reversed bit or byte.

Preferably, the selecting means for selecting the respective high and low data transmission rates of at least one of the modems selects the respective data transmission rates in response to the amount of echo.

Advantageously, the selecting means for selecting the high and low data transmission rates of the at least one of the modems selects the respective data transmission rates for minimising echo.

Ideally, the selecting means of the first modem selects the respective high and low data transmission rates for the first modem in response to echo.

In one embodiment of the invention the selecting means of the second modem selects the respective high and low data transmission rates for the second modem in response to echo.

In another embodiment of the invention the data signals transmitted between the respective first and second modems are digitally encoded data signals.

In one embodiment of the invention the first modem is a PCM codec modem.

In another embodiment of the invention the second modem is a linear codec modem.

In a further embodiment of the invention the selecting means of the respective first and second modems are operational for altering the respective selected high and low data transmission rates of the respective modems during a retraining interrupt during data transmission.

The advantages of the invention are many. By virtue of the fact that respective high and low transmission rates are selected during handshaking for the respective modems, between which data is to be transmitted, the modem from which the highest volume of data is to be transmitted can be set at its high data transmission rate, while the other modem is set to transmit data at its low data transmission rate. Additionally, as soon as the position reverses and the modem transmitting at its low data transmission rate requires to transmit a higher volume of data than the other modem, the modem which had been transmitting at the low data transmission rate can be set to transmit data at its high data transmission rate, after the other modem has been set to transmit its low data transmission rate. This, thus, leads to particularly efficient transmission of data, furthermore, minimises distortion and corruption of transmitted data. In particular the method and telecommunications system according to the invention are particularly suitable for use in a transmission system where at least one of the modems is PCM modem, and indeed where the other modem may also be a PCM modem, or a linear codec modem or the like.

The invention will be more clearly understood from the following description of some preferred embodiments thereof which are given by way of example only with reference to the accompanying drawings, in which:

Fig. 1 is a block representation of a telecommunications system according to the invention,

Fig. 2 is a timing chart illustrating the operation of the telecommunications system of Fig. 1, and

Fig. 3 is a timing chart illustrating the operation of the telecommunications system according to another embodiment of the invention.

Referring to the drawings and initially to Fig. 1 there is illustrated a telecommunications system according to the invention which is indicated generally by the reference numeral 1. In this embodiment of the invention data is being transmitted through the telecommunications system 1 between a PC 2 of a client and a server 3 of an internet service provider. First and second modems, namely, a first modem provided by a PCM codec modem 5 associated with the server 3, and a second modem, namely, a linear codec modem 6 associated with the PC 2 communicate the server 3 and the PC 2 through the telecommunications system 1. The data is digitised data and is transmitted between the modems 5 and 6 as a series of constellation points. First and second transmit data buffers 8 and 9, respectively, associated with the server 3 and the PC 2, respectively hold data to be transmitted from the server 3 and the PC 2 prior to the data being relayed to the corresponding PCM modem 5 and linear modem 6. First and second receive data buffers 10 and 11, respectively, receive data for the server and the PC 2, respectively, transmitted by the other of the server 3 and the PC 2. Respective first and second control means, namely, first and second microprocessors 14 and 15, respectively, control the operation of the PCM modem 5 and the linear modem 6 and their corresponding first and second transmit data buffers 8 and 9, as well as the first and second receive buffers 10 and 11, as will be described below. However, it will be appreciated that the first and second microprocessors 14 and 15 may be

incorporated in the corresponding modems 5 and 6, respectively, or the second microprocessor 15 could be implemented by the PC 2, and the first microprocessor 14 could be implemented by a computer controlling the server 3.

During handshaking test data is transmitted between the PCM modem 5 and the linear modem 6 under the control of the first and second microprocessors 14 and 15, respectively, for determining respective high and low data transmission rates for the PCM modem 5 and the linear modem 6 for minimising echo. A selecting means implemented by software in the first microprocessor 14 reads the results of the test data transmission between the PCM modem 5 and the linear modem 6, and selects a suitable high data transmission rate and a suitable low data transmission rate for the PCM modem 5 which minimises echo. A selecting means implemented by software in the second microprocessor reads the results of the test data transmission between the PCM modem 5 and the linear modem 6 and selects a suitable high data transmission rate and a suitable low data transmission rate for the linear modem 6 also for minimising echo. The high data transmission rates for the respective modems 5 and 6 may be the same or different, however, in general, they will be different, and the low data transmission rates selected for the PCM modem 5 and the linear modem 6 may likewise be the same or different, but typically, will be different. Methods for selecting a high and a low data rate for a modem for minimising echo will be well known to those skilled in the art. Once the respective high and low data transmission rates have been selected for the PCM modem 5 and the linear modem, and the remainder of the handshaking protocol has been completed, the telecommunications system is ready for use.

During transmission of data between the PC 2 and the server 3 respective monitoring means implemented by software in the microprocessors 14 and 15 monitor the corresponding transmit data buffers 8 and 9 and the corresponding receive data buffers 10 and 11. Each first and second microprocessor 14 and 15 comprises a means for generating a switch signal, which is implemented by software, in response to the microprocessor 14 or 15 detecting overflow of data from its corresponding transmit data buffer 8 or 9, if the corresponding modem 5 or 6 is operating at its low data transmission rate. The switch signal is a predetermined

signal as will be described below. Each first and second microprocessor 14 and 15 comprises a means for setting the data transmission rate of its corresponding modem 5 or 6 at its appropriate high or low data transmission rate in response to a received switch signal. The respective means for setting the data transmission rates are implemented in software in the corresponding microprocessor 14 and 15.

The mechanism by which the data transmission rates for the respective modems 5 and 6 are set will now be described. Assuming that the PCM modem 5 is set to transmit at its high data transmission rate, and the linear modem 6 is set to transmit at the low data transmission rate, and assuming further that the second transmit data buffer 9 associated with the linear modem 6 is commencing to overflow, on the second microprocessor 15 detecting overflow of the second transmit data buffer 9 indicating an increased volume of data to be transmitted by the PC 2 to the server 3 the second microprocessor 15 generates the switch signal and relays the switch signal to the linear modem 6 for transmission to the PCM modem 5 and reception by the first microprocessor 14. On the first microprocessor 14 receiving the switch signal, the first microprocessor 14 checks the status of the first transmit data buffer 8. Provided the status of the first transmit data buffer 8 indicates that the volume of data being transmitted by the server 3 does not require the PCM modem 5 to operate at its high data transmission rate then the first microprocessor 14 sets the PCM modem 5 to transmit at its low data transmission rate. On the second microprocessor 15 detecting the data being received by the second received data buffer 11 is being transmitted by the PCM modem 5 at its low data transmission rate the second microprocessor 15 sets the linear modem 6 to transmit at its high data transmission rate. In this embodiment of the invention the PCM modem 5 continues to transmit at its low data transmission rate and the linear modem 6 continues to transmit at its high data transmission rate until the first microprocessor 14 detects the first transmit data buffer 8 commencing to overflow. On an overflow situation being detected by the first microprocessor 14 in the first transmit data buffer 8, the first microprocessor 14 generates and transmits the switch signal through the PCM modem 5 to the linear modem 6 which is received by the second microprocessor 15. The second microprocessor 15 checks the status of the second transmit data buffer 9, and provided the status of the second transmit data buffer 9 indicates that the

volume of data to be transmitted by the PC 2 could be accommodated by the low data transmission rate of the linear modem 6, the second microprocessor 15 sets the linear modem 6 to transmit at its low data transmission rate. On the first microprocessor 14 detecting data being received by the first receive data buffer 10 being transmitted by the linear modem 6 at its low data rate, the first microprocessor 14 sets the PCM modem 5 to transmit at its high data transmission rate, and so operation of the telecommunications system 1 continues.

Referring now to Fig. 2 a timing chart for the operation of the telecommunications system 1 will now be described. Initially from time t_0 to t_2 the PCM modem is operating at its low data transmission rate, which in this embodiment of the invention is at a low power level. From time t_0 the linear modem 6 is operating at its high data transmission rate. At time t_1 the first microprocessor 14 determines that the first transmit data buffer 8 is commencing to overflow and transmits a switch signal to the second microprocessor 15 through the PCM modem 5 and the linear modem 6. After checking the second receive data buffer 11 the second microprocessor 15 determines that the linear modem 6 can be operated at its low data transmission rate, and at time t_2 sets the linear modem 6 to transmit at its low data transmission rate. In this embodiment of the invention the linear modem 6 is operated at the same power level during its high and low data transmission rates, however, during its low data transmission rate the spacing between the levels at which constellation points are transmitted is increased as can be seen in Fig. 2. At time t_3 on the first microprocessor 14 detecting from the first receive data buffer 10 that the data being transmitted by the linear modem 6 is being transmitted at its low data rate, the first microprocessor 14 sets the PCM modem 5 to transmit at its high data transmission rate, and in this embodiment of the invention increases the power level at which the PCM modem 5 is operating to a high power level, as can be seen in Fig. 2. When operating at its high data transmission rate the PCM modem 5 operates at a significantly higher power level than when operating at its low data transmission rate, however, the spacing between the levels at which the constellation points are transmitted remains unaltered from its low data transmission rate.

At time t_4 the second microprocessor 15 detects the second transmit data buffer 9

commencing to overflow indicating a high volume of data to be transmitted from the PC 2. The second microprocessor 15 transmits a switch signal through the linear modem 6 and the PCM modem 5 for reception by the first microprocessor 14. The first microprocessor 14 reads the first transmit data buffer 8 which indicates that the volume of data being transmitted by the server 3 does not require the PCM modem to transmit at its high data transmission rate, and at time t_5 the first microprocessor 14 sets the PCM modem 5 to operate at its low data transmission rate. The second microprocessor 15 on detecting from the second receive data buffer 11 that the PCM modem 5 is transmitting data at its low data transmission rate sets the linear modem 6 at time t_6 to operate at its high data transmission rate. As discussed above the power level at which the linear modem 6 operates between its high and low data transmission rate remains unchanged, however, the spacing between the levels at which constellation points can be transmitted is significantly increased thereby permitting data to be transmitted by the linear modem 6 at a significantly higher rate.

In this embodiment of the invention the spacing between the levels at which constellation points can be transmitted during the high data transmission rate of the linear modem 6 is set to accommodate a relatively high number of constellation points, while at its low data transmission rate the spacing between the constellation point level is such as to facilitate transmission of a lesser number of constellation points.

The operation of the telecommunications system 1 continues with the PCM modem 5 operating at its low data transmission rate and the linear modem 6 operating at its high data rate until time t_7. At time t_7 the first microprocessor 14 detects a high volume of data to be transmitted by the PCM modem 5 from the server 3, and the first microprocessor 14 transmits a switch signal which is responded to by the second microprocessor 15 setting the linear modem 6 to transmit at time t_8 at its low data transmission rate. At time t_9 having detected the change in data transmission rates in the linear modem 6, the first microprocessor 14 sets the PCM modem 5 to transmit at its high data rate until times t_{10}, t_{11} and t_{12} at which stage the position is again reversed.

In this embodiment of the invention if at any time a switch signal is received by either one of the microprocessors 14 or 15, and that microprocessor detects that its corresponding transmit data buffer 8 or 9 indicates that the volume of data to be transmitted is still high, the microprocessor which has received the switch signal will fail to respond to the switch signal until such time as the volume of data to be transmitted associated with that microprocessor has reduced to a level which could be accommodated by the modem transmitting at its low data transmission rate.

The switch signal may be any predetermined signal which is understood by the respective first and second microprocessors 14 and 15. Since the telecommunications system 1 is transmitting data as a series of constellation points, the switch signal may be provided by an illegal constellation point, or an illegal constellation point followed by a predetermined sequence of legal constellation points. Alternatively, the switch signal may be provided by a predetermined sequence of legal constellation points, or alternatively may be provided by a predetermined illegal sequence of legal constellation points. An illegal constellation point is a constellation point which would not be used in the communications protocol. An illegal sequence of constellation points is a sequence of constellation points which would not be used in the transmission protocol.

In general, there is a small amount of spare encoding capacity in communication protocols where some groups of legal constellation points are not normally used. One or more of these combinations could likewise be used as a switching signal.

A method for providing a switch signal which is specific to the protocol in use, could for example be provided by an inverted HDLC CRC or some other transformation of the CRC, for example, bit reversed, byte reversed, add/subtract a fixed number, or the like. Alternatively, a specific type of frame of data may be used.

Referring now to Fig. 3 a timing chart of a method according to an alternative embodiment of the invention for switching the modems 5 and 6 between their respective high and low data transmission rates will now be described. In this embodiment of the invention the first microprocessor 14 which is associated with the

PCM modem 5 controls switching of the respective modems 5 and 6 between their respective high and low data transmission rates. At time t_0 the PCM modem 5 is transmitting at its low data transmission rate and the linear modem 6 is transmitting at its high data transmission rate. At time t_1 the first microprocessor 14 determines from the first transmit data buffer 8 that the volume of data to be transmitted by the server requires the PCM modem 5 to operate at its high data transmission rate, and at time t_1 the first microprocessor 14 transmits a switch signal of any one of the type already described through the PCM modem 5 for reception by the second microprocessor 15 through the linear modem 6. At time t_2 the second microprocessor 15 receives the switch signal and at time t_3 sets the linear modem 6 to operate at its low data transmission rate and retransmits the switch signal back to the first microprocessor 15 through the linear modem 6 and the PCM modem 5. At time t_4 the first microprocessor 14 receives the returned switch signal and at time t_5 sets the PCM modem 5 to operate at the high data transmission rate. At time t_6 the first microprocessor 14 determines that it is no longer necessary for the PCM modem 5 to operate at its high data transmission rate and accordingly, at time t_6 transmits a switch signal to the second microprocessor 15 through the respective PCM and linear modems 5 and 6, respectively. At time t_7 having transmitted the switch signal the first microprocessor 14 sets the PCM modem 5 to operate at its low data transmission rate. At time t_8 the second microprocessor 15 receives the switch signal and at time t_9 sets the linear modem 6 to operate at its high data transmission rate.

It should be noted that in both methods for operating the telecommunications system 1 which have been described with reference to the timing charts of Figs. 2 and 3, the respective modems 5 and 6 are operated to avoid the two modems 5 and 6 simultaneously operating at their respective high data transmission rates.

While the telecommunications system 1 has been described as comprising a PCM codec modem and a linear codec modem, it will be appreciated that the system may be provided with two PCM codec modems.

While the communication in the telecommunications system described with reference to the drawings has been described as being between a client's PC and

the server of an internet service provider, it will be appreciated that the telecommunications system according to the invention may be used for communicating digital data between a client and any source, and between a PC and any other computer system or between two PCs or the like.

Claims

1. A method for transmitting data between respective first and second modems (5,6) in a telecommunications system (1) wherein at least one of the modems (5,6) is a PCM modem (5), characterised in that the method comprises the steps of selecting respective high and low data transmission rates for the respective modems (5,6) during handshaking, the respective high and low data transmission rates for the respective modems (5,6) being the same or different, and setting the modems (5,6) to transmit at their respective high data transmission rates during transmission in response to the volume of data to be transmitted such that neither of the two modems (5,6) are set to transmit at their respective high data transmission rates until the other of the two modems (5,6) has been set to transmit at its low data transmission rate.

2. A method as claimed in Claim 1 characterised in that the high data transmission rates of the respective modems are different.

3. A method as claimed in Claim 1 or 2 characterised in that the low data transmission rates of the respective modems are different.

4. A method as claimed in any preceding claim characterised in that the high and low data transmission rates of the first modem (5) are selected by selecting corresponding high and low transmission power levels.

5. A method as claimed in any preceding claim characterised in that the high and low data transmission rates of the first modem (5) are selected by selecting the spacing between signal levels of the data signal to be transmitted.

6. A method as claimed in any preceding claim characterised in that the high and low data transmission rates of the second modem (6) are selected by selecting the spacing between signal levels of the data signal to be transmitted.

7. A method as claimed in any preceding claim characterised in that the data

signals are transmitted as constellation points.

8. A method as claimed in Claim 7 characterised in that the low data transmission rate of the first modem (5) is selected by increasing the spacing between the constellation points.

9. A method as claimed in Claim 7 or 8 characterised in that the low data transmission rate of the second modem (6) is selected by increasing the spacing between the constellation points.

10. A method as claimed in any preceding claim characterised in that the respective modems (5,6) are responsive to a switch signal received from the other of the two modems (5,6) for switching from one data transmission rate to the other.

11. A method as claimed in Claim 10 characterised in that the second modem (6) is responsive to the received switch signal received from the first modem (5) for switching from its high data transmission rate to its low data transmission rate.

12. A method as claimed in Claim 10 or 11 characterised in that each modem (5,6) is responsive to the received switch signal for switching from its high data transmission rate to its low data transmission rate.

13. A method as claimed in Claim 11 or 12 characterised in that each modem (5,6) is responsive to the received switch signal only if the volume of data to be transmitted by that modem (5,6) no longer requires the high data transmission rate.

14. A method as claimed in any of Claims 10 to 13 characterised in that the switch signal is provided by a predetermined signal.

15. A method as claimed in Claim 14 characterised in that the switch signal comprises at least one illegal constellation point.

16. A method as claimed in Claim 15 characterised in that the at least one illegal constellation point is followed by a predetermined sequence of legal constellation points.

17. A method as claimed in Claim 15 or 16 characterised in that the switch signal comprises a predetermined sequence of legal constellation points.

18. A method as claimed in Claim 17 characterised in that the predetermined sequence of legal constellation points is an illegal sequence.

19. A method as claimed in any of Claims 10 to 18 characterised in that the switch signal comprises a predetermined frame of data signals.

20. A method as claimed in any of Claims 10 to 19 characterised in that the switch signal comprises a reversed bit or byte.

21. A method as claimed in any preceding claim characterised in that the respective high and low data transmission rates of at least one of the modems (5,6) are determined in response to the amount of echo.

22. A method as claimed in Claim 21 characterised in that the high and low data transmission rates of the at least one modem (5,6) are determined for minimising echo.

23. A method as claimed in Claim 21 or 22 characterised in that the respective high and low data transmission rates are determined for the first modem (5) in response to echo.

24. A method as claimed in any of Claims 21 to 25 characterised in that the respective high and low data transmission rates are determined for the second modem (6) in response to echo.

25. A method as claimed in any preceding claim characterised in that the data signals transmitted between the respective first and second modems (5,6) are digitally encoded data signals.

26. A method as claimed in any preceding claim characterised in that the first modem (5) is a PCM codec modem.

27. A method as claimed in any preceding claim characterised in that the second modem (6) is a linear codec modem.

28. A method as claimed in any preceding claim characterised in that the respective high and low data transmission rates of the respective modems are alterable during a retraining interrupt during data transmission.

29. A telecommunications data transmission system comprising respective first and second modems (5,6) wherein at least one of the modems (5,6) is a PCM modem (5), the respective first and second modems (5,6) comprising handshaking means, characterised in that the respective handshaking means of each modem (5,6) comprise a selecting means (14,15) for selecting respective high and low data transmission rates for the respective modems (5,6) during handshaking, the respective high and low data transmission rates for the respective modems (5,6) being the same or different, and each modem (5,6) comprises a means (14,15) for setting its data transmission rate at its high data transmission rate in response to the volume of data to be transmitted such that neither of the two modems (5,6) are set to transmit at their respective high data transmission rates until the other of the two modems (5,6) has been set to transmit at its low data transmission rate.

30. A transmission system as claimed in Claim 29 characterised in that the high data transmission rates of the respective modems (5,6) are different.

31. A transmission system as claimed in Claim 29 or 30 characterised in that the low data transmission rates of the respective modems (5,6) are different.

32. A transmission system as claimed in any of Claims 29 to 31 characterised in that the selecting means (14) of the first modem (5) selects the high and low data transmission rates of the first modem (5) by selecting corresponding high and low transmission power levels.

33. A transmission system as claimed in any of Claims 29 to 32 characterised in that the selecting means (14) of the first modem (5) selects the high and low data transmission rates of the first modem (5) by selecting the spacing between signal levels of the data signal to be transmitted.

34. A transmission system as claimed in any of Claims 29 to 33 characterised in that the selecting means (15) of the second modem (6) selects the high and low data transmission rates of the second modem (6) by selecting the spacing between signal levels of the data signal to be transmitted.

35. A transmission system as claimed in any of Claims 29 to 34 characterised in that the data signals are transmitted as constellation points.

36. A transmission system as claimed in Claim 35 characterised in that the selecting means (14) of the first modem (5) selects the low data transmission rate of the first modem (5) by increasing the spacing between the constellation points.

37. A transmission system as claimed in Claim 35 or 36 characterised in that the selecting means (15) of the second modem (6) selects the low data transmission rate of the second modem (6) by increasing the spacing between the constellation points.

38. A transmission system as claimed in any of Claims 29 to 37 characterised in that each modem (5,6) comprises a switch signal generating means (14,15) for generating a switch signal in response to the volume of data to be transmitted by that modem (5,6), and the means (14,15) for setting the data transmission rate of

each modem (5,6) being responsive to a switch signal received from the other of the two modems (5,6) for switching the modem having received the switch signal from one data transmission rate to the other.

39. A transmission system as claimed in Claim 38 characterised in that the means (14,15) for setting the data transmission rate of the second modem (6) is responsive to the received switch signal received from the first modem (5) for switching from its high data transmission rate to its low data transmission rate.

40. A transmission system as claimed in Claim 38 or 39 characterised in that the means (14,15) for setting the data transmission rate of each modem (5,6) is responsive to the received switch signal for switching from its high data transmission rate to its low data transmission rate.

41. A transmission system as claimed in Claim 39 or 40 characterised in that the means (14,15) for setting the data transmission rate of each modem (5,6) is responsive to the received switch signal only if the volume of data to be transmitted by that modem (5,6) no longer requires the high data transmission rate.

42. A transmission system as claimed in any of Claims 38 to 41 characterised in that the switch signal is provided by a predetermined signal.

43. A transmission system as claimed in Claim 42 characterised in that the switch signal comprises at least one illegal constellation point.

44. A transmission system as claimed in Claim 43 characterised in that the at least one illegal constellation point is followed by a predetermined sequence of legal constellation points.

45. A transmission system as claimed in Claim 42 characterised in that the switch signal comprises a predetermined sequence of legal constellation points.

46. A transmission system as claimed in Claim 44 or 45 characterised in that the predetermined sequence of legal constellation points is an illegal sequence.

47. A transmission system as claimed in Claim 42 characterised in that the switch signal comprises a predetermined frame of data signals.

48. A transmission system as claimed in any of Claims 42 to 48 characterised in that the switch signal comprises a reversed bit or byte.

49. A transmission system as claimed in any of Claims 29 to 48 characterised in that the selecting means (14,15) for selecting the respective high and low data transmission rates of at least one of the modems (5,6) selects the respective data transmission rates in response to the amount of echo.

50. A transmission system as claimed in Claim 49 characterised in that the selecting means (14,15) for selecting the high and low data transmission rates of the at least one of the modems (5,6) selects the respective data transmission rates for minimising echo.

51. A transmission system as claimed in Claim 49 or 50 characterised in that the selecting means (14) of the first modem (5) selects the respective high and low data transmission rates for the first modem (5) in response to echo.

52. A transmission system as claimed in any of Claims 49 to 51 characterised in that the selecting means (15) of the second modem (6) selects the respective high and low data transmission rates for the second modem (6) in response to echo.

53. A transmission system as claimed in any of Claims 29 to 52 characterised in that the data signals transmitted between the respective first and second modems (5,6) are digitally encoded data signals.

54. A transmission system as claimed in any of Claims 29 to 53 characterised in

that the first modem (5) is a PCM codec modem.

55. A transmission system as claimed in any of Claims 29 to 54 characterised in that the second modem (6) is a linear codec modem.

56. A transmission system as claimed in any of Claims 29 to 55 characterised in that the selecting means (14,15) of the respective first and second modems (5,6) are operational for altering the respective selected high and low data transmission rates of the respective modems (5,6) during a retraining interrupt during data transmission.

ABSTRACT

"A method for transmitting data between respective first and second modems in a telecommunications system, and a telecommunications system"

A telecommunications data transmission system (1) for communicating between a client's PC (2) and a server (3) of an internet service provider comprises transmission between a PCM codec modem (5) of the server (3) and a liner codec modem (6) of the PC (2). Data received by the PCM modem (5) for the server (3) is passed through a first receive data buffer (10) to the server (3), while a second receive data buffer (11) passes data from the linear modem (6) to the PC (2). First and second transmit data buffers (8,9) hold data to be transmitted by the PCM modem (5) and the linear modem (6), respectively. First and second microprocessors (14,15) control the data transmission rates of the modems (5,6), respectively. During handshaking first and second data transmission rates are selected by the microprocessor (14,15) for the PCM modem (5) and for the linear modem (6) for minimising echo in the transmission. The modem (5,6) having to transmit the highest volume of data is selectively operated at its respective high data transmission rates, while the other of two modems (5,6) is operated at its low data transmission rate. The microprocessors (14,15) control the modems (5,6) to avoid the two modems (5,6) operating simultaneously at their respective high data transmission rates.

Figs. 1 and 2 to accompany the abstract.

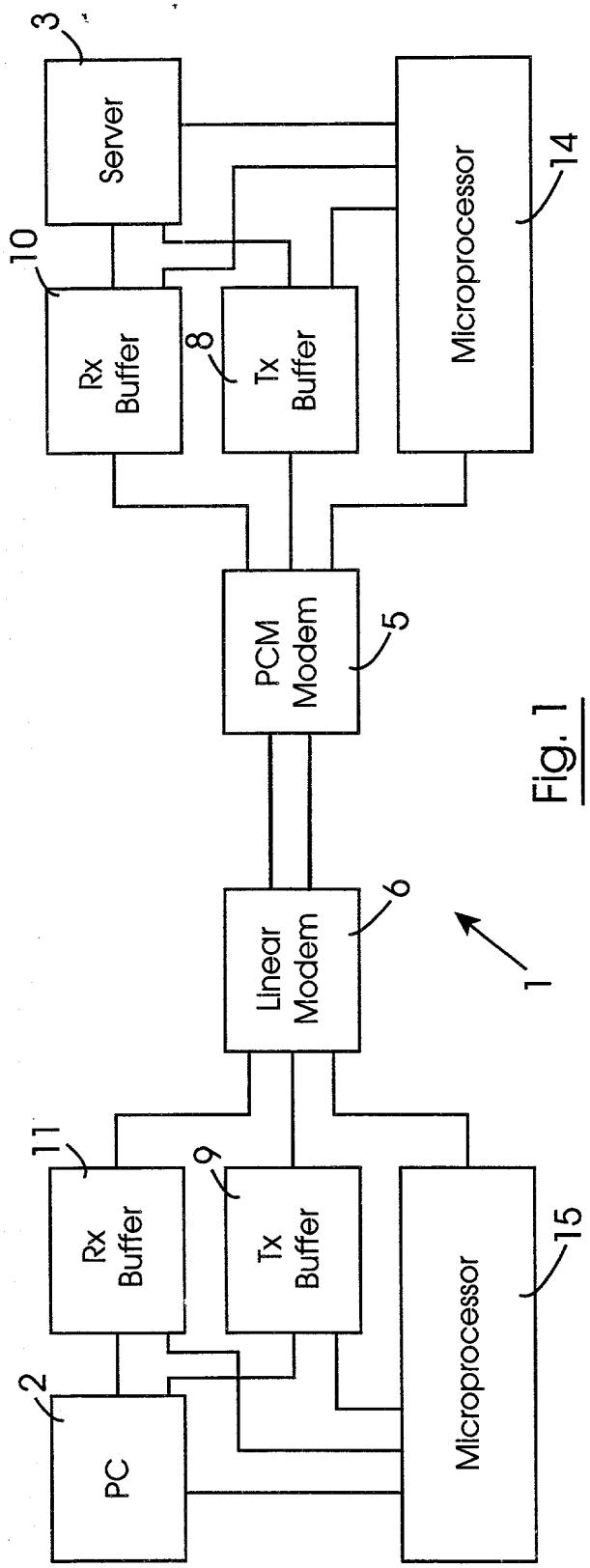
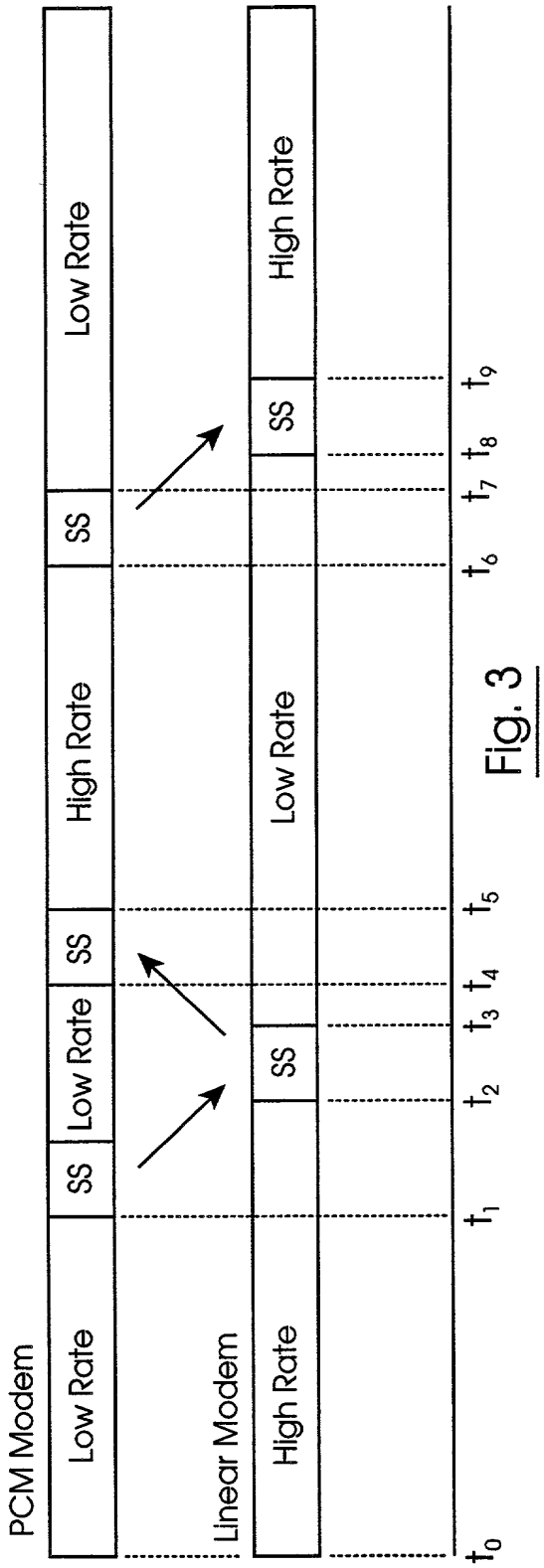

3
Server
10
Rx Buffer
8
Tx Buffer
14
Microprocessor
PCM Modem
5
Linear Modem
6
1
11
Rx Buffer
9
Tx Buffer
15
Microprocessor
2
PC

Fig. 1


PCM Modem
Low Rate
SS
Low Rate
SS
High Rate
SS
High Rate
Linear Modem
High Rate
SS
Low Rate
SS
High Rate
t_0
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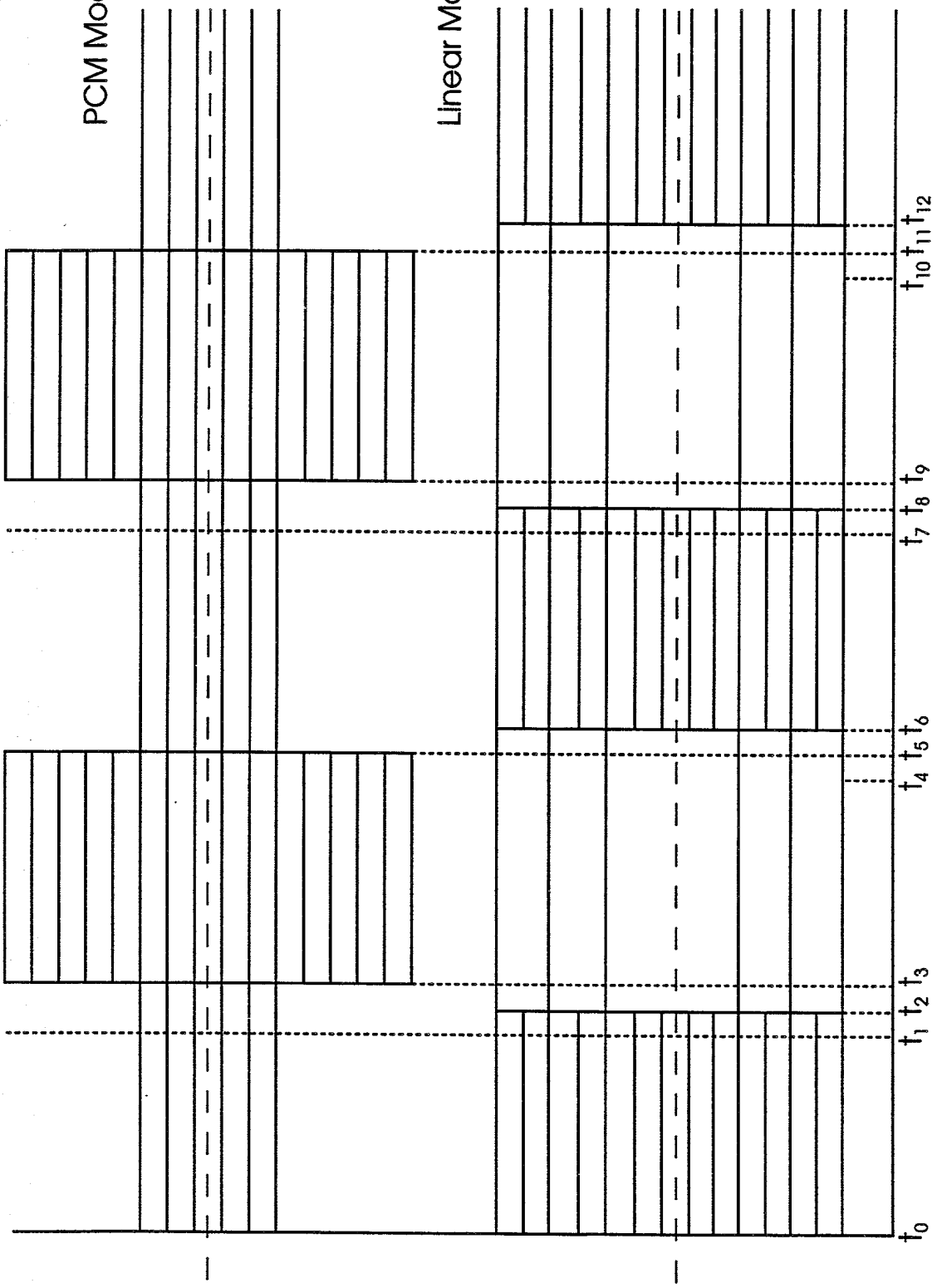
t_2
t_3
t_4
t_5
t_6
t_7
t_8
t_9

Fig. 3

Fig. 2



DECLARATION AND POWER OF ATTORNEY FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

As a below named inventor, I hereby declare that: My residence, mailing address, and citizenship are as stated below next to my name. I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

"A method for transmitting data between respective first and second modems in telecommunications system, and a telecommunications system"

the application of which

☑ is attached hereto OR ☒ was filed on September 13, 2000 as United States Application Number or PCT International Application Number PCT/IE 00/00105 (Confirmation No. _____), and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified application, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part application(s), material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application(s) which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application(s) having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date	Priority Claimed Yes	Priority Claimed No
S99/0767	Ireland	September 13, 1999	☒	☐

I hereby claim domestic priority benefits under 35 United States Code §120 of any United States application(s), §119(e) of any United States provisional application(s), or §365(c) of any PCT International application(s) designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in a listed prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge my duty to disclose any information material to the patentability of this application as defined in 37 C.F.R. 1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Prior U.S. or International Application Number(s)	U.S. or International Filing Date	Status

I hereby appoint all attorneys of SUGHRUE MION, PLLC who are listed under the USPTO Customer Number shown below as my attorneys to prosecute this application and to transact all business in the United States Patent and Trademark Office connected therewith, recognizing that the specific attorneys listed under that Customer Number may be changed from time to time at the sole discretion of Sughrue Mion, PLLC, and request that all correspondence about the application be addressed to the address filed under the same USPTO Customer Number.

23373

PATENT TRADEMARK OFFICE

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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City	State	Zip	Country Ireland IEX
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Given Name (first and middle [if any])		Family Name or Surname	
Inventor's Signature		Date	
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Mailing Address:			
City	State	Zip	Country
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Given Name (first and middle [if any])		Family Name or Surname	
Inventor's Signature		Date	
Residence: City	State	Country	Citizenship
Mailing Address:			
City	State	Zip	Country
NAME OF FOURTH INVENTOR:			
Given Name (first and middle [if any])		Family Name or Surname	
Inventor's Signature		Date	
Residence: City	State	Country	Citizenship
Mailing Address:			
City	State	Zip	Country
NAME OF FIFTH INVENTOR:			
Given Name (first and middle [if any])		Family Name or Surname	
Inventor's Signature		Date	
Residence: City	State	Country	Citizenship
Mailing Address:			
City	State	Zip	Country